

REFRIGERATOR USING EPS INSULATING MATERIAL

Field of the Invention

5 The present invention relates to a refrigerator using
an expandable polystyrene (EPS) insulating material, and,
more specifically, to a refrigerator manufactured by an
assembly method in which the need for welding operation is
eliminated and an EPS material is used as an insulating
10 material.

Background of the Invention

15 Household refrigerators generally include an outer
cabinet and an inner liner with a foam insulation member
interposed therebetween. Two side walls and a top wall of
the outer cabinet are formed out of a single piece of sheet
metal. Front edge portions of the side walls and the top
wall are bent to form two front side face portions and a top
20 front face portions, respectively. Thereafter, upper edges
of the front side face portions are welded with
corresponding edges of the top front face portions. Further,
since the outer cabinet is formed from sheet metal or
similar generally flexible material, the outer cabinet
25 requires to be reinforced in order to adequately withstand
loads exerted thereon during normal use of the refrigerator.

Such reinforcing members are welded to the outer case to increase structural rigidity thereof.

The foam insulation member is usually formed out of polyurethane composition material in liquid or gas form.

5 The polyurethane composition material is introduced into the space between the outer cabinet and the inner liner, expand throughout the space and then are solidified by curing to form the foam insulation member. This foam insulation member which adheres to both the outer cabinet and the inner
10 liner increases structural rigidity of the outer cabinet.

However, when the foam insulation member is formed from the polyurethane composition material, lots of chlorofluorocarbon (CFC) gases are used, which destructs ozone layer. In order to prevent such a problem, it is
15 preferable to employ insulating materials such as EPS materials which do not use CFC gases in manufacturing process.

Furthermore, if the outer cabinet is manufactured wholly by an assembly method without welding, the recycling
20 thereof can be facilitated since it can be easily disassembled.

Summary of the Invention

25 It is, therefore, an object of the present invention to provide a refrigerator including an outer case

manufactured by an assembly method in which the need for welding operation is eliminated and an EPS material is used as an insulating material.

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5 In accordance with an aspect of the present invention, there is provided a refrigerator cabinet assembly including an outer case including two laterally spaced side walls and a top wall interconnecting the two side walls, each of the side walls and the top wall including front face portions and rear face portions, a plurality of reinforcing members
10 for increasing the structural strength of the outer case, and means for securing said plurality of reinforcing members to the outer case, wherein the refrigerator cabinet assembly is devoid of welded portion.

15 In accordance with an embodiment of the present invention, there is provided a refrigerator including a cabinet assembly including an outer metal case including two laterally spaced side walls and a top wall interconnecting the two side walls, a plurality of reinforcing members for increasing the structural strength of the outer metal case
20 and means for securing said plurality of reinforcing members to the outer metal case, and a plurality of insulating members made of expandable polyethylene, wherein the refrigerator cabinet assembly is devoid of welded portion.

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Brief Description of the Drawings

The above and other objects and features of the present invention will become apparent from the following description of preferred embodiments given in conjunction
5 with the accompanying drawings, in which:

Fig. 1 is a perspective view of a refrigerator cabinet assembly in accordance with the present invention;

Fig. 2 provides an exploded perspective view of the
10 refrigerator cabinet assembly in Fig. 1, showing the lower portion thereof;

Fig. 3 shows a perspective view of the refrigerator cabinet assembly, showing the rear portion thereof; and

Fig. 4 illustrates an exploded perspective view of the
15 refrigerator cabinet assembly in Fig. 1, showing the EPS insulating materials.

Detailed Description of the Preferred embodiments

20 Fig. 1 shows a perspective view of a refrigerator cabinet assembly in accordance with the present invention.

The refrigerator cabinet assembly includes an outer case 10 and a plurality of reinforcing members. The outer case 10, which is shown in Fig. 1 by dotted lines, has a top
25 wall 100 and a first and a second side walls 120 and 130. As shown in Fig. 1, the side walls 120 and 130 and the top

wall 100 are integrally formed from bending a piece of sheet metal such that the side walls 120 and 130 are arranged in an upstanding, substantially parallel manner and are spaced and interconnected by the top wall 100. Preferably, pre-coated sheet metal may be used to form the outer case. When pre-coated sheet metal is used, cabinet coating process can be eliminated and the time required for assembly of the refrigerator can be decreased.

Front edge portions of each of the side walls 120 and 130 are bent inwardly so as to define a first and a second front face portions 122 and 132. Further, rear edge portions are also bent laterally inwardly so as to define a first and a second rear face portions 124 and 134. Front and rear edge portions of the top wall 100 are likewise bent to form a third front face portion 102 and a third rear face portion 104, respectively.

Reference will now be made to Fig. 1 in describing said plurality of reinforcing members.

The upper front reinforcing member 40 has a shape of elongated, rectangular bars. Two side end portions of the upper front reinforcing member 40 are secured to the first and the second front face portions 122 and 132, respectively. Further, top left and right portions of the upper front reinforcing member 40 are secured to the third front face portion 102. Preferably, self-drilling screws 45 are used for securing the upper front reinforcing member 40 to the

outer case 10.

Reinforcing brackets 42 and 44 are also provided in order to increase the structural rigidity of the upper left and the right corner portions of the outer case 10. The reinforcing brackets 42 and 44 have a first and a second leg portions which are arranged substantially perpendicular to each other. The reinforcing brackets 42 and 44 may be secured to the outer case 10 by the same self-drilling screws 45 which are used for securing the upper front reinforcing member 40. In order to align the screw holes of the reinforcing brackets 42 and 44 to those of the upper front reinforcing member 40, protrusions are provided on the upper front reinforcing member 40 and receiving holes for accommodating the protrusions are provided on the reinforcing brackets 42 and 44. In such a configuration, time required for assembly can be decreased since the reinforcing brackets 42 and 44 are properly positioned on the upper front reinforcing member 40 just by matching the protrusions and the receiving holes.

Reference will now be made to Fig. 2 in describing a first and a second lower side reinforcing members 20 and 22 and a lower front reinforcing member 30. Each lower side reinforcing member 20 and 22 is in a U-shape and manufactured out of a relatively thick steel sheet. The lower side reinforcing members 20 and 22 are located along the inner surfaces of the lower edges of the left and the

right side walls 120 and 130. Each lower side reinforcing member 20 and 22 is secured by, e.g., self-drilling screws to the first and the second front face portions 122 and 132 and the first and the second rear face portions 124 and 134.

5 The lower front reinforcing member 30 has a shape of elongated rectangular bar. Both side end portions of the lower front reinforcing member 30 are secured to the inner surface of the first and the second front face portions 122 and 132, respectively. Preferably, the lower front reinforcing member 30 is first secured to the side reinforcing members 20 and 22 and, then, the lower side reinforcing members 20 and 22 are secured to the outer casing 10. In order to increase the structural rigidity of the refrigerator cabinet, the lower side reinforcing members 20 and 22 are connect by one or more steel plates. For example, a first and a second base plate 24 and 26 can be secured to the lower surfaces of the lower side reinforcing members 20 and 22. On the second base plates 26, a compressor (not shown) prepared for the refrigerating cycle of the refrigerator can be located. The base plates 24 and 26 may also be secured by self-drilling screws. Further, a bottom plate 140 is provided above the lower side reinforcing members 20 and 22. The bottom plate 140 may be secured to the lower side reinforcing members 20 and 22 via blocks (not shown) having a generally C-shaped cross section.

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Reference will now be made to Fig. 3 in describing an

upper and a lower reinforcing member 50 and 60. Each rear reinforcing members 50 and 60 has a shape of elongated rectangular bar. The upper rear reinforcing member 50 is secured to the inner surface of the first and the second rear face portions 124 and 134 by, e.g., self-drilling screws. Likewise, the lower rear reinforcing member 60 is of a shape of elongated rectangular bar and is secured to the first and the second rear face portions 124 and 134. Preferably, the lower rear reinforcing member 60 is secured at the position right above the bottom plate 140. In such a case, the lower rear reinforcing member 60 may be of a bar shape having a generally L-shaped cross section. After the upper and the lower reinforcing members 50 and 60 are secured to the outer case 10, a rear plate (not shown) is fixed to the outer case 10 by screws.

After the assembly of the reinforcing members are finished, decorators may be provided in order to cover the head portions of the screws.

As an insulating material in accordance with the present invention, an EPS material is employed. A plurality of EPS materials are located on the inner surfaces of the top wall 100, two side walls 120 and 130, rear plate and on the bottom plate 140, which are indicated by the reference numerals 82, 83, 84, 85 and 86 in Fig. 4, respectively. The EPS materials are cut into a shape to fit the space between the outer case 10 and the inner liner. The assembly of the

EPS material can be performed after all of the reinforcing members are secured to the outer case 10 or during the securing process thereof.

5 While the present invention has been shown and described with respect to the preferred embodiments, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the following claims.

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